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TECHNICAL MEMORANDUM (NASA) 38

KIM-1 INTERFACE ADAPTER TO 3-WIRE TELETYPE SYSTEMS

This brief technical note has been submitted to the KIM-1 microcomputer group publication, KIM User Notes. It is of interest to others who have 3-wire ASR-33 teletype systems in using microcomputer hardware with the Ohio University Prototype Omega Sensor Receivers.

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## I. INTERFACING KIM-1 WITH A MODIFIED FULL DUPLEX 3-WIRE ASR-33 TELETYPE SYSTEM

One of the problems we had with KIM-1 was that of using the built-in TTY interface with an ASR-33 machine originally designed for use with an SPC-12 computer. The TTY machine was further modified with a separate tape-read control circuit for use with an INTELLEC 4.

The KIM-1 circuit is inherently designed for use with a full duplex isolated 4 terminal system. It will not work directly with a 3-wire system; however a single +5V supply interface has been devised to use with the latter.

The 3-wire ASR-33 TTY has a printer and keyboard circuit which appears as if the two positive returns for the keyboard and printer are the same wire. The actual circuit is more complex, but for the purpose of analysis, may be reduced to the schematic shown on the left of Figure 1. Here there is a very low impedance between the positive returns for the keyboard, or pins 1 and 3 of the Jones plug adapter to the SPC-12. When the normal 150 ohm resistors on KIM-1 are connected respectively to these two terminals, the TTY performs very erratically because the instantaneous printer output of KIM is being fed back to the KIM keyboard recognition software with little attenuation and without any delay. A sophisticated active low pass filter could be devised to eliminate this unwanted high frequency hash. However, there is a simpler approach.

The KIM application connector pins R and S are disconnected and not used. The +5V supply (as on pin A of the KIM application connector) is connected to the printer positive return, pin 1 of the Jones connector. Pin 3 is not connected to anything but is operative because of the internal low Z path in the modified 3-wire ASR-33 system. The negative printer input pin 2, is connected to the normal KIM terminal U through a 150 ohm current limiting resistor. This has the same effect as far as the printer driver is concerned as the original KIM, only the resistor is on the other side of the printer to isolate the direct feedback path. The negative pin 4 of the keyboard is connected through the interface level translator circuit shown in the center of Figure 1. The low pass filter consisting of the 1 kohm series resistor and 2.2 mfd capacitor is absolutely essential to eliminate high frequency feedback hash. The filter circuit at pin T on KIM is not sufficient because of the added loop gain of the level translator. The 2N2222A - 2N2907A combination now provides a proper input for terminal T which is always ON at about 1V until a keyboard signal comes along. The 130 ohm resistor in series here limits the current to something like that required in the original KIM-1 interface. In debugging this circuit we inadvertently blew the input transistor connected to pin T on KIM. However, this was replaced with another 2N2222A which works just as well as the original transistor. 5 volts at pin T will burn out the base of most switching transistors without some current limiting protection.

One of the problems we have had at Ohio University is that of trying to use the same ASR-33 machine with several different microcomputers. The effective 3-wire system has been used with JOLT, SPC-12, INTELLEC 4, KIM-1, and special purpose 6800 systems.

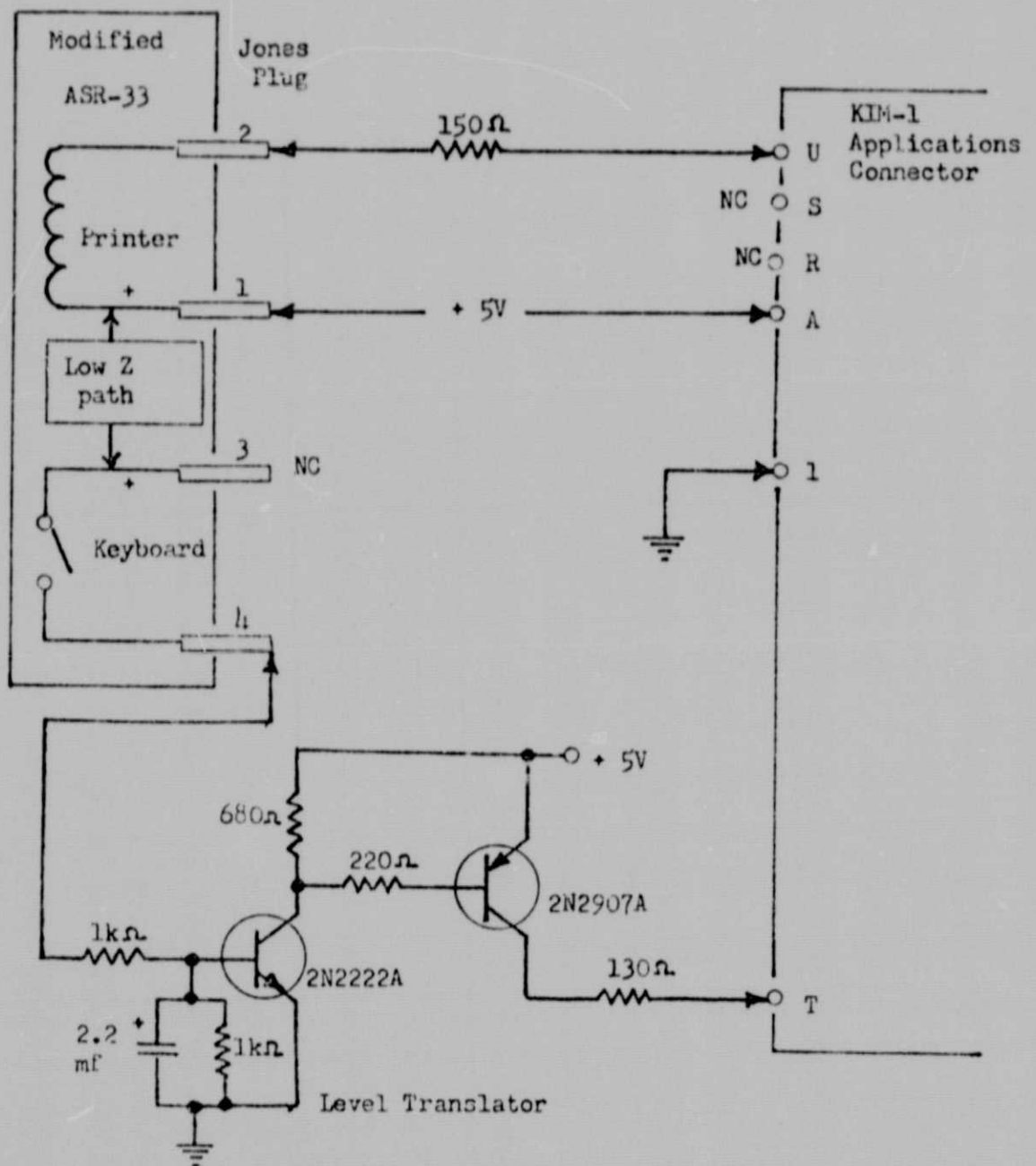


Figure 1. 3-Wire TTY Interface for KIM.

Each one requires some care in the interface but all the systems are interchangeable using a common 8 prong Jones plug from the ASR-33.

This particular modification provides the features of KIM to the teletype machine with only 3 wires except for the modified paper tape reader on the particular ASR-33 used.

## II. BIBLIOGRAPHY

KIM-1 USER MANUAL, Publication of MOS Technology, Valley Forge Industrial Park, Norristown, PA 19401 (1976) contains details on KIM-1 circuits and TTY interface.